# **VOLUME CONTENTS**

Volume 5, Number 1		1992
F. W. Petersen and J. S. J. van Deventer	1	The interaction between organics and metal complexes in adsorption columns
L. G. S. Sobral and M. Granato	17	Palladium: extraction and refining
S. Acar and P. Somasundaran	27	Effect of dissolved mineral species on the electro- kinetic behaviour of sulfides
M. A. Fichera and M. W. Chudacek	41	Batch cell flotation models—a review
R. A. Williams and G. H. Kelsall	57	Degradation of ferrosilicon media in dense medium separation circuits
P. N. Holtham	79	Primary and secondary fluid velocities on spiral separators
M. Vanangamudi, J. Mitra and T. C. Rao	93	Technical Note Analysis of performance of a 76 mm Vorsyl Separator
D. G. Osborne	103	Conference Reports World Coal Institute Conference: Coal in the Environment
T. R. Jones	105	Advances in Particulate Technology
H. von Michaelis	106	Randol Gold Forum, Cairns '91
AusIMM	107	World Gold '91 Conference
J. A. Meech	108	93rd Annual General Meeting of the Canadian Institute of Mining, Metallurgy and Petroleum
R. Pascoe	110	NATO ASI: Innovations in Advanced Flotation Technology
A. C. Partridge	111	5th Australian Coal Preparation Conference
J. P. Franzidis	112	Column '91
M. S. Prasad	113	African Mining 91
B. A. Wills	114	Mineral Bioprocessing
	117	Calendar of International Conferences, Symposia Courses and Meetings of Interest

## 119 Recent Mineral Processing Publications

## i Information for Contributors

Volume 5, Number 2		1992
G. Barbery*	123	Liberation 1,2,3: theoretical analysis of the effect of space dimension on mineral liberation by size reduction
T. J. Napier-Munn and A. J. Lynch	143	The modelling and computer simulation of mineral treatment processes—current status and future trends
R. Del Villar, J. A. Finch, C. O. Gómez and R. Espinosa-Gomez	169	Flotation column amenability and scale-up parameter estimation tests
L. G. Austin, W. Hilton and B. Hall	183	Mill power for conical (Hardinge) type ball mills
G. K. N. S. Subasinghe and E. G. Kelly	193	Predicting the cut specific gravity of a coal washing spiral
P. N. Holtham	205	Particle transport in gravity concentrators and the Bagnold effect
M. M. Antonijević and N. V. Pacović	223	Investigation of molybdenite oxidation by sodium dichromate
N. Rajmohan and K. T. Jacob	235	Combined sulphation-chlorination roasting of oxides
M. J. N. Correia and J. R. Carvalho	245	Technical Note Chloride leaching of Portuguese lead concentrates
R. A. Williams	255	Book Reviews Principles of Powder Technology, edited by M. Rhodes
	256	Column '91, edited by G. E. Agar, B. J. Huls and D. B. Hyma
	256	World Gold '91
	257	Randol Gold Forum—Cairns '91
	257	Evaluation and Optimization of Metallurgical Performance, edited by D. Malhotra, R. R. Klimpel and A. L. Mular
	257	Proceedings of the 11th International Coal Preparation Congress
	257	Proceedings of the Sixteenth International Conference on Coal and Slurry Technologies

	265	Recent Mineral Processing Publications
	i	Information for Contributors
Volume 5, Numbers 3–5		1992
	5	SPECIAL ISSUE
REAGENTS	SIN	MINERALS ENGINEERING
at the Camborne	Sch	International Symposium held ool of Mines, Cornwall, England, September 1991
K. Atkinson	277	Foreword
M. S. Prasad	279	Reagents in the mineral industry—recent trends and applications
S. J. Adkins and M. J. Pearse	295	The influences of collector chemistry on kinetics and selectivity in base-metal sulphide flotation
N. J. Bolin and P. Norén	311	Use of reagents in Boliden Mineral AB
D. J. Bradshaw, A. E. Upton and C. T. O'Connor	317	A study of the pyrite flotation efficiency of dithio- carbamates using factorial design techniques
K. A. Matis, K. A. Kydros and G. P. Gallios	331	Processing a bulk pyrite concentrate by flotation reagents
R. Houot and D. Duhamet	343	The use of sodium sulphite to improve the flotation selectivity between chalcopyrite and galena in a complex sulphide ore
E. Beas-Bustos and R. D. Crozier	357	Moly/copper separation from concentrate of the combined acid and basic circuits at El Teniente
E. J. Wellham, L. Elber and D. S. Yan	381	The role of carboxy methyl cellulose in the flotation of a nickel sulphide transition ore
C. I. Basilio, D. S. Kim, R. H. Yoon and D. R. Nagaraj	397	Studies on the use of monothiophosphates for precious metals flotation
M. J. G. Salum,	411	The role of sodium sulphide in amine flotation of

Conference Report

C. T. O'Connor

A. C. de Araujo and

A. E. C. Peres

259 10th Annual University of Cape Town-University of

Stellenbosch Minerals Processing Symposium

261 Calendar of International Conferences, Symposia,

Courses and Meetings of Interest

silicate zinc minerals

Z. Sadowski	421	The influence of sodium lignin sulfonate on the adsorption of sodium dodecyl sulfate on salt-type mineral surfaces
H. Gruner and U. Bilsing	429	Cassiterite flotation using styrene phosphonic acid to produce high-grade concentrates at high recoveries from finely disseminated ores—comparison with other collectors and discussion of effective circuit configurations
Qiang Zhou and Shouci Lu	435	Acidized sodium silicate—an effective modifier in fluorite flotation
R. Köster, B. Schreck, W. von Rybinski and B. Dobiás	445	New reagent systems for the flotation of kaolinite
RH. Yoon, D. R. Nagaraj, S. S. Wang and T. M. Hildebrand	457	Beneficiation of kaolin clay by froth flotation using hydroxamate collectors
C. L. L. Pinto, A. C. de Araujo and A. E. C. Peres	469	The effect of starch, amylose and amylopectin on the depression of oxi-minerals
G. Moody	479	The use of polyacrylamides in mineral processing
Qun Wang and K. Heiskanen	493	Selective hydrophobic flocculation in apatite- hematite system by sodium oleate
L. Lorenzen and J. A. Tumilty	503	Diagnostic leaching as an analytical tool for evaluat- ing the effect of reagents on the performance of a gold plant
K. A. Lewis	513	SOLVEX: a database for the selection and appraisal of solvent extraction reagents
M. Neira, T. J. O'Keefe and J. L. Watson	521	Solvent extraction reagent entrainment effects on zinc electrowinning from waste oxide leach solutions
L. Lorenzen	535	An electrochemical study of the effect of potential on the selective dissolution of base metal sulphides in sulphuric acid
J. Dubel, R. W. Smith, M. Misra and S. Chen	547	Microorganisms as chemical reagents: the hematite system
D. W. Barr, M. A. Jordan, P. R. Norris and C. V. Phillips	557	An investigation into bacterial cell, ferrous iron, pH and $E_{\rm h}$ interactions during thermophilic leaching of copper concentrates
	569	Registered Delegates
G. S. Dobby	573	Conference Reports 30th Annual Conference of Metallurgists

J. A. Meech	573 IFAC Workshop on Expert Systems in Mineral and Metal Processing
D. Barr	574 Biohydrometallurgy 91
B. A. Wills	576 XVII International Mineral Processing Congress
	579 Calendar of International Conferences, Symposia, Courses and Meetings of Interest
	587 Recent Mineral Processing Publications
	I Information for Contributors

Volume 5, Number 6		1992
G. S. Hansford and J. T. Chapman	597	Batch and continuous biooxidation kinetics of a refractory gold-bearing pyrite concentrate
D. M. Miller and G. S. Hansford	613	Batch biooxidation of a gold-bearing pyrite- arsenopyrite concentrate
D. W. Lauder	631	The recycle mechanism in recirculating separation systems
R. W. Allen and T. D. Wheelock	649	Effect of preparation techniques on kinetics of oil agglomeration of fine coal
R. del Villar and J. A. Finch	661	Modelling the cyclone performance with a size dependent entrainment factor
D. I. Hoyer	671	Power consumption in centrifugal and nutating mills
M. T. Ityokumbul	685	A new modelling approach to flotation column design
T. Yalcin	695	Determination of flotation rate constants from semi- batch flotation data
A. Yehia	707	Technical Notes Adsorption of dioctyl sodium sulphosuccinate on some synthetic carbonate apatites
V. P. Yadav and T. Sharma	715	Leaching of glauconitic sandstone in acid lixiviants
M. P. Schwarz	721	Conference Report Regional PHOENICS User Conference
	723	Calendar of International Conferences, Symposia, Courses and Meetings of Interest
	731	Recent Mineral Processing Publications
	-	Information for Contributors

Volume 5, Number 7		1992
D. M. Miller and G. S. Hansford	737	The use of the logistic equation for modelling the performance of a biooxidation pilot plant treating a gold-bearing arsenopyrite-pyrite concentrate
A. D. Dance and R. D. Morrison	751	Quantifying a black art: the electrostatic separation of mineral sands
C. W. Notebaart and F. P. van der Meer	767	Development of a cryogenic canister for the study of selectivity problems in HGMS
L. Milin, K. T. Hsieh and R. K. Rajamani	779	The leakage mechanisms in the hydrocyclone
R. H. Eric and E. Burucu	795	The mechanism and kinetics of the carbothermic reduction of Mamatwan manganese ore fines
W. W. Fisher, F. A. Flores and J. A. Henderson	817	Comparison of chalcocite dissolution in the oxygenated, aqueous sulfate and chloride systems
M. A. Reuter, J. S. J. van Deventer and W. Wilmans	835	A semi-empirical model for the electro-osmotic dewatering of slurries between fixed electrodes
J. Freund and B. Dobias	851	Technical Note Characterisation of adsorption layers on fluorite particles with gamma flotation
N. Castro	855	Conference Report Minerals, Metals and the Environment
	857	Calendar of International Conferences, Symposia, Courses and Meetings of Interest
	863	Recent Mineral Processing Publications
	1	Information for Contributors
Volume 5, Number 8		1992
R. A. Williams, F. J. Dickin, T. Dyakowski, O. M. Ilyas, Z. Abdullah and M. S. Beck	867	Looking into mineral process plant?
R. D. Pascoe	883	Capital and operating costs of minerals engineering plants—a review of simple estimation techniques
Y. Wang and E. Forssberg	895	Aggregation between magnetite and hematite ultra- fines utilizing remanent magnetization
S. S. Ibrahim and N. A. Abdel-Khalek	907	The action of different types of corn starch on the flocculation of phosphate slimes
R. H. Eric and A. Ergeneci	917	High temperature phase relations and thermodynamics in the iron-tin-sulphur system

T. Chandrasekaran	931	Technical Notes  A new approach to the kinetics of size reduction in ball milling
P. J. T. Mills and C. T. O'Connor	939	The use of the axial dispersion model to describe mixing in a flotation column
C. Hiçyilmaz and G. Özbayoglu	945	The effects of amine and electrolytes on the zeta- potential of scheelite from Uludag, Turkey
P. A. Farinha, M. J. N. Correia and J. R. Carvalho	953	Leaching of gold from a Portuguese concentrate with thiourea
		Book Reviews
D. Sutherland	961	
B. A. Wills	962	Colloid Chemistry in Mineral Processing, edited by J. S. Laskowski and J. Ralston
	962	Flotation of Sulphide Minerals 1990, edited by K. S. E. Forssberg
	963	Solvent Extraction 1990, edited by T. Sekine and S. Kusakabe
J. Watson	964	Conference Report SME Annual Meeting
	965	Calendar of International Conferences, Symposia, Courses and Meetings of Interest
	971	Recent Mineral Processing Publications
	1	Information for Contributors
Volume 5, Number 9		1992
T. J. Harvey, W. T. Yen and J. G. Paterson	975	Selective zinc extraction from complex copper/zinc sulphide concentrates by pressure oxidation
A. E. Wraith and R. Harris	993	Fluidisation of a mineral concentrate at reduced pressure
Z. Golab and R. W. Smith	1003	Accumulation of lead in two fresh water algae
S. R. Rao, R. Gehr, M. Riendeau, D. Lu and J. A. Finch	1011	Acid mine drainage as a coagulant
L. G. Austin and D. N. Sutherland	1021	Corrections to cyclosizer data for liberation calculations
Manqiu Xu and J. A. Finch	1029	Solids mixing in the collection zone of flotation columns

P. Stonestreet and JP. Franzidis	1041	Development of the reverse coal flotation process: application to column cells
P. Mavros	1053	Technical Notes Validity and limitations of the closed-vessel analytical solution to the axial dispersion model
F. T. Da Silva	1061	A thermodynamic approach for the sulphuric acid pressure leaching of nickeliferous laterites
R. A. Williams	1069	Book Review The Chemistry of Gold Extraction, by J. O. Marsden
	,,,,,,	and C. I. House
		Conference Report
G. S. Hansford	1071	Minerals Engineering '92—Vancouver, Canada, 14–16 April 1992
	1073	Calendar of International Conferences, Symposia, Courses and Meetings of Interest
	1077	Recent Mineral Processing Publications
	1079	New Patents
	1	Information for Contributors

## Volume 5, Numbers 10-12

1992

#### SPECIAL ISSUE

## **MINERALS ENGINEERING '92**

Proceedings of the International Conference held at the Westin Bayshore Hotel, Vancouver, Canada, 14-16 April 1992

## CONTENTS

K. Atkinson and B. A. Wills	1083	Opening address: the increasing importance of the
		environmental role of mineral processing

<b>Technical Session 1: Conc</b>	entratio	on Methods
B. Knelson	1091	The Knelson concentrator. Metamorphosis from crude beginning to sophisticated world wide acceptance
A. B. Holland-Batt	1099	A study of the potential for improved separation of fine particles by use of rotating spirals
F. F. Lins, M. M. Veiga, J. A. Stewart, A. Papalia and R. Papalia	1113	Performance of a new centrifuge (Falcon) in concentrating a gold ore from Texada Island, B.C., Canada

G. Ferrara, R. Lapasin 1123 Modelling the rheological behaviour of dense media and P. Bevilacqua and design of medium circuits in dynamic D.M.S. processes C. W. Notebaart and 1135 High selectivity in HGMS by capture on the down-F. P. van der Meer stream side of matrix elements J. H. P. Watson and 1147 Theoretical and single-wire studies of vortex magnetic Zhengnan Li separation **Technical Session 2: Flotation Technology** I. Farr 1169 Evaluation of alternative flotation technologies for copper cleaning & copper/nickel separation at Inco's Thompson Mill I. M. Flint, 1185 Column flotation of iron ore H. E. Wyslouzil, V. L. de Lima Andrade and D. J. Murdock P. J. T. Mills, 1195 The mixing characteristics of solid and liquid phases J. B. Yianatos and in a flotation column C. T. O'Connor M. Falutsu and 1207 Froth performance in commercial sized flotation G. S. Dobby columns M. C. Harris, 1225 An evaluation of the role of particle size in the flotation J-P. Franzidis. of coal using different cell technologies C. T. O'Connor and P. Stonestreet C. E. Jordan and 1239 Rapid flotation using a modified bubble-injected F. J. Susko hydrocyclone and a shallow-depth froth separator for improved flotation kinetics S. K. Nicol, K. P. Galvin 1259 Ion flotation—potential applications to mineral and M. D. Engel processing **Technical Session 3: Flotation Theory and Reagents** V. Kirjavainen, M. Lyyra, 1279 Study on using potentiostatic control in selective sulphide flotation H. Laapas and K. Heiskanen J. L. Scott and 1287 Ionic strength effects in diamine flotation of quartz R. W. Smith and magnetite 1295 On the mechanisms of beryl flotation in the presence M. L. Torem, A. E. Peres of some metallic cations and R. Adamian

### **Technical Session 4: Expert Systems**

J. A. Meech

R. A. Bearman and
R. W. Milne
P. M. Benford and
1307 Expert systems: opportunities in the minerals industry
P. M. Benford and
1325 An advisory package for flotation operators using a

real-time expert system

- Technical Session 5: Hydro and Biometallurgy
- G. Miller and D. J. Readett 1335 The Mount Isa Mines Limited copper solvent extraction and electrowinning plant

  P. Rusin, J. Cassells,
  J. Sharp, R. Arnold and
  N. A. Sinclair

  G. S. Hansford and
  A. D. Bailey

  1365 Effect of ultrasound on acidified brine leaching of
- J. A. Barrera-Godinez,
  T. J. O'Keefe and
  J. L. Watson

  1365 Effect of ultrasound on acidified brine leaching of double-kiln treated EAF dust

#### **Technical Session 6: Gold Metallurgy**

L. Lorenzen and 1377 The mechanism of leaching of gold from refractory J. S. J. Van Deventer Y. Nakahiro, U. Horio, 1389 Recovery of gold with ion exchange resin from M. Niinae, E. Kusaka and leaching solution by acidothioureation T. Wakamatsu T. J. Van der Walt and 1401 Non-ideal behaviour in counter-current in-pulp J. S. J. Van Deventer adsorption cascades M. C. Costello, 1421 Use of the ammonia cyanide leach system for gold I. C. Ritchie and copper ores with reference to the retreatment of the D. J. Lunt TORCO tailings

#### **Technical Session 7: Environmental Aspects**

- D. E. Spiller

  1433 Environmental applications of mineral processing technologies
- P. B. Mitchell and
   K. Atkinson
   The use of super-expanding polyacrylamide polymer in controlling the environmental impact of metalliferous mine waste
  - 1453 Minerals Engineering '92 Registered Delegates
  - 1457 Faces at Minerals Engineering '92

- 1459 Calendar of International Conferences, Symposia, Courses and Meetings of Interest
- 1465 Recent Mineral Processing Publications
- 1469 New Patents
  - I Title Section, Volume Contents and Author Index
- XVII Information for Contributors